

LEVEL

2

ENGAGEMENT OF CONCEALED TARGETS WITH SMALL ARMS

AD A061355

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE

by

AUBREY B. STACY, MAJ. USA
B.A., Henderson State University, 1966.
M.B.A., Georgia State University, 1975.

Fort Leavenworth, Kansas
1978

DDC FILE COPY

This document has been approved
for public release and sale; its
distribution is unlimited.

BEST AVAILABLE COPY

78 08 11 030

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Engagement of Concealed Targets with Small Arms		5. TYPE OF REPORT & PERIOD COVERED Final Report 9 June 78
7. AUTHOR(s) Stacy, Aubrey B., MAJ, USA		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Student at the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Command and General Staff College ATTN: ATSW-SE		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE 9 June 78
		13. NUMBER OF PAGES 58
		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) Approved for public release; distribution unlimited.		
18. SUPPLEMENTARY NOTES Master of Military Art and Science (MMAS) Thesis prepared at CGSC in partial fulfillment of the Masters Program requirements, U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) See reverse.		

↙ This study is designed to determine the need for concealed target training with small arms for infantrymen. The investigation is focused on an analysis of historical experience, current doctrine, and the psychological impact of concealed targets at the small unit level.

The investigation reveals that concealed targets are the predominant form that personnel targets assume on the modern battlefield, confirmed by both historical evidence and U.S. Army doctrine. Psychologically, the transition from TRAINFIRE ranges to most combat situations is lacking. Concealed target training using live ammunition under realistic conditions offers the potential of advancing combat effectiveness, as well as eliminating a large percentage of initial combat casualties. Psychologically, it will prepare the soldier to respond confidently to his first combat experience. ↗

⑥ Engagement of Concealed Targets with Small Arms.

⑩ Aubrey B. Stacy MAJ, USA
U.S. Army Command and General Staff College
Fort Leavenworth, Kansas 66027

⑨ Final report, 9 June 1978 ⑪ 9 Jun 78

⑬ 69 p.

(Classified) Distribution limited to U.S. Government agencies only; proprietary information. Other requests for this document must be referred to U.S. Army Command and General Staff College, ATTN: ATSV-SE, Fort Leavenworth, Kansas 66027.

A Master of Military Art and Science thesis presented to the faculty of the U.S. Army Command and General Staff College, Fort Leavenworth, Kansas 66027

✓ 037 260

alt

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of candidate Aubrey Bruce Stacy, Major, Infantry

Title of Thesis Engagement of Concealed Targets With
Small Arms

Approved By:

Thomas F. Shifer, Research Advisor

LTC Bradley R. Linn Ed. S., Member, Consulting Faculty

Accepted this 10th day of May 1978 by [Signature]
Director, Master of Military Art and Science.

The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the US Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

APPROVED	
U.S.	FOR REVIEW
DATE	BY: Section <input checked="" type="checkbox"/>
REVIEWED	BY: Section <input type="checkbox"/>
JCS/ASST	
BY: <u>[Signature]</u>	
DISTRIBUTION/AVAILABILITY CODES	
Dist.	AVAIL. and/or SPECIAL
A	

ABSTRACT

In this century there has been considerable controversy concerning the decline of rifle marksmanship and hit probability on the battlefield. Targets are no longer exposed personnel grouped in formations to mass their fire. The lethality of modern weapons systems has made dispersion and concealment essential for units to survive and fight. Fire is normally distributed into suspected enemy positions rather than clearly defined emplacements.

This study is designed to determine if concealed target training can significantly contribute to small unit combat effectiveness and achievement of fire superiority. While doctrine fully recognizes that "enemy personnel are rarely visible except in the close assault," current rifle ranges are designed for fire delivery solely against visible silhouette targets.

While the TRAINFIRE ranges were developed to overcome the problem created by concealed targets, they basically replaced the bull's-eye target with pop-up silhouettes. The soldier is conditioned to visually detect a target prior to engagement, completely contrary to the requirements of most combat. This lack of transfer from training to actual combat perplexes the soldier when a confident response is required. There is a tendency to withhold fire or

desperately fire about the general area in response to a concealed opponent.

It is the conclusion of this study that concealed target training will significantly contribute to overall combat effectiveness and the early achievement of fire superiority. Preparatory training must simulate actual combat and present the most effective actions to prove useful later under fire. Dissimilarities create unnecessary stress and disunity of action which will degrade effective performance.

ACKNOWLEDGEMENTS

In any organization as large and steeped in tradition as the United States Army, change is often difficult. A continuing evaluation is necessary to determine if current techniques address actual requirements or have become ends unto themselves.

I wish to especially thank a staff sergeant at Fort Polk in 1970, who shook my perceptions of range firing by asking if I really felt that we were properly preparing infantry trainees to engage combat targets. At the time I was a test and evaluation officer with the USAIS Weapons Department involved in a test rearranging the variables on the rifle range to increase hit probability. Time has erased the imprint of his nametag from my mind but not his provocative question. This thesis is for him and every infantryman who has questioned the application of our marksmanship program later in combat.

I wish to thank my highly skilled wife, Carolyn, for without her typing ability and support this thesis would not have been possible.

TABLE OF CONTENTS

	Page
THESIS APPROVAL PAGE	iii
ABSTRACT	iv
ACKNOWLEDGEMENTS	vi
LIST OF FIGURES	ix

Chapter

I. INTRODUCTION	1
The Problem	1
The Subproblems	4
Hypothesis	4
Methodology	5
Delimitations	5
Definition of Terms	6
Assumptions	6
II. REVIEW OF RELATED LITERATURE	7
Overview	7
Historical Development of Doctrine	7
Concealed Target Experience	13
Techniques and Technology	23
Psychological Effects.	26
Current and Emerging Doctrine	32
Summary of Literature Search	35
Summary of Literature Search	35

	Page
III. METHODOLOGY	37
Effective Fire	38
Role of Small Arms Fire	39
Psychological Effects	40
Components of Combat Effectiveness	41
IV. FINDINGS	42
Subproblems	42
Essential Elements of Analysis	48
V. CONCLUSIONS AND RECOMMENDATIONS	50
Conclusions	50
Recommendations	51
BIBLIOGRAPHY	54

LIST OF FIGURES

Figure 1 Distributed Fire Page 34

CHAPTER I

INTRODUCTION

"It is of first importance that the soldier, high or low, should not have to encounter in war things which, seen for the first time, set him in terror or perplexity."

-Clausewitz-¹

THE PROBLEM

The United States Army since its inception has placed great emphasis on marksmanship in preparation for combat. The traditional known distance (KD) ranges were upgraded to TRAINFIRE (pop-up silhouette targets) ranges in the 1950's. Collective marksmanship and fire distribution were evaluated on squad technique of fire ranges. Arrays of silhouette targets appeared at varying ranges. Electronic counters recorded the number of hits on each silhouette as the firers serviced the targets. Scores on these ranges were closely scrutinized by generations of commanders with the sure knowledge that they were clear indicators of their soldiers' ability to hit the enemy in combat.

In every conflict in modern warfare there arises an outcry over the tremendous amount of ammunition required to

¹S.L.A. Marshall, Men Against Fire (New York: William Morrow and Company, 1947), p. 49.

kill one enemy soldier on the battlefield. The natural reaction is to upgrade marksmanship training to increase hit probability. So the researchers massage the variables relating to marksmanship on the rifle ranges to attempt to achieve significantly higher scores through some variation.

The author was part of this quest during the Vietnam War as a Test and Evaluation Officer with the Rifle Marksmanship Evaluation Study Group, Weapons Department, United States Army Infantry School in 1970. As an outgrowth of this involvement and previous battlefield experience in the Republic of Vietnam, serious questions arose in the author's mind as to the direction of the study. During two tours in combat there had been no clear enemy targets against which to use the principles of marksmanship. Targets were identified by sound and had consisted of woodlines, dense foliage, and clumps of vegetation. Either these experiences were unique or preparatory weapons training did not fully address the environment for which it was intended.

Extensive reading on combat experiences in all the major conflicts of this century point out the dilemma of modern war. Major Frank D. Ely of the 15th Infantry in Tientsin, China, wrote the following:

In the presence of the 'void of the battlefield' men who are good target shots experience a feeling akin to despair when they realize how unequal to the demand for hits is all their target range teachings and practice.--They become shaken in their

earlier confidence, because there is no visible target.--This is the first step to the loss of morale.²

G.I.A. Marshall, U.S. Army historian of the European Theater of Operations in World War II, noted that concealed targets were the norm in World War II combat. Visible targets were the exception and characteristic of movement and breakthrough.³ Marshall describes the reactions and emotions in the initial engagement of a unit:

The men scatter as the fire breaks around. When they go to ground, most of them are lost to sight of each other. Those who can still be seen are for the most part strangely silent. They are shocked by the mystery of their situation. Here is a surprise of a kind which no one had taught them to guard against. The design of the enemy has little to do with it; it is the nature of battle which catches them unaware. Where are the targets? How does one engage an enemy who does not seem to be⁴ present?

Our recent experience in Vietnam confirms the lack of discernible targets. Visible targets were characteristic of a defensive position attacked en masse or a meeting engagement. The Human Resources Research Office (HumRRO) conducted a series of combat interviews and discovered only 37% of their respondents had engaged an observed enemy in initial contact situations. They delivered fire either at "suspected enemy positions" or "covered an area."⁵

²Major Frank D. Ely, Battle Fire--Its Waste and Its Control (no publisher, no date), p. 23.

³Marshall, Men Against Fire, p. 48.

⁴Marshall, Men Against Fire, p. 47.

⁵George J. Magner, George R. Hoak, and T. O. Jacobs, Interviews on Small-Unit Combat Actions in Vietnam, Interim Report Summary (Arlington, Va.: Resources Research Organization, 1967).

Today's infantry training at Fort Benning, Georgia, continues relatively unchanged from previous years. The live-fire training is focused on pop-up silhouette targets exposed at varying ranges. The expectation of a visual stimuli is reinforced time after time in the training environment. This perception sets up today's rifleman for the same shock as Marshall's World War II generation of infantrymen. At no time does the infantry trainee, either officer or enlisted, engage a concealed target under the current live-fire training instruction.

This research proposes to identify and evaluate the parameters of the concealed target environment and to determine if combat effectiveness can be increased.

THE SUBPROBLEMS

Questions relating to the problem to be investigated in review of literature and later analysis:

1. How prevalent are concealed targets in combat?
2. What is the psychological impact of concealed targets?
3. Are concealed targets detectable using current doctrine and technology?
4. What techniques of fire offer the best effects against concealed targets?

HYPOTHESIS

Concealed target training for the infantryman will improve combat effectiveness and the ability to achieve fire superiority.

METHODOLOGY

The methodology used will require an investigation of the factors pertaining to effective fire in a concealed target environment. An analysis of these elements will be followed by conclusions and recommendations based on a logical analytical sequence.

The review of related literature in Chapter II will center on those questions raised in the subproblems. The historical development of doctrine and experience factors will be part of this examination. Particular attention will be directed to actual combat data and experience.

It will be necessary to study the uses and effects of infantry small arms fire as they might apply to concealed targets. The implications of concealed target engagement upon combat effectiveness will be in Chapter III, Methodology.

A synthesis will tie together all the facts, both qualitative and quantitative, during the outline of the findings. The conclusions and recommendations will be the final chapter of the thesis.

DELIMITATIONS

The literature search will be limited to the time period 1900 to the present.

The individual infantryman and his weapon in the context of the rifle squad will be the basis of evaluation.

Only daylight concealed target environments are considered. Target engagement during periods of limited

visibility will not be examined in this research.

THE DEFINITIONS OF TERMS

Concealed targets--enemy personnel who are in close proximity, yet who remain hidden from visual detection.

Fire superiority--fire measured in volume and accuracy which is superior to that of the enemy. Usually diminishes enemy fire effectiveness and allows maneuver by the friendly unit.

Hit probability--ability to hit a target, expressed in terms of number of hits/rounds fired.

All other terms used during this study are Department of the Army standardized terms except where identified by footnote.

ASSUMPTIONS

The basic assumption is that combat at the squad level will remain basically unchanged. The mission of infantry is "to close with the enemy by means of fire and maneuver in order to destroy or capture him, or to repel his assault by fire, close combat, and counterattack."

The enemy confronting the U.S. rifle squad will continue to use terrain and camouflage in deceiving the infantryman as to his position.

Mechanized units will continue to frequently dismount in future operations. While in the dismounted role, infantrymen will function in their primary mission.

CHAPTER II

REVIEW OF RELATED LITERATURE

OVERVIEW

The review of related literature is oriented toward answering those questions raised in Chapter I by the subproblems.

The review will look at historical and current experience and doctrine as it relates to concealed targets. Particular attention will be directed to combat experiences during this century. Soldier reactions will be examined in concealed target environments to determine the impact on combat effectiveness and ability to achieve fire superiority.

The individual infantryman in the context of the rifle squad remains the focal point.

HISTORICAL DEVELOPMENT OF DOCTRINE

Early in its history, the U.S. Army drew its infantrymen from a population which did not require marksmanship training. On the American frontier survival rested on one's ability to protect and feed his family by using a rifle. Americans were considered among the best marksmen in the world.

Marksmanship was considered an inborn trait in this country, and it was not until 1858 that the Army saw fit to

authorize systematic target practice.¹ With the passing of the frontier, the myth of the American trait of natural marksmanship evaporated. The School of Musketry was established to train marksmanship instructors. The natural frontier environment of elusive and live targets was replaced with Known Distance (KD) target ranges and fundamentals of range firing.

The rapid firing rifle replaced the smooth bore musket, raining death on the traditional masses of troop formations moving at close order in the open. With the additional development of the machinegun, the effectiveness of small arms became devastating at the turn of the century. Tactics evolved which emphasized dispersion and extensive use of cover and concealment.

The U.S. Army tactics of the period as outlined in Tactics and Techniques of Infantry was that "the ability to see and fire" took precedence over taking advantage of concealment or cover. Instructions in this official publication stated:

Observation of the enemy is necessary in order to take note of the effect of fire, take advantage of opportunity to fire on fleeting targets, and conserve fire power when targets disappear from view.²

After World War I the Infantry Journal magazine published a book, Infantry in Battle, collecting the wartime

¹Howard H. McFann, John A. Hammes, and John E. Taylor, "TRAINFIRE I: A New Course in Basic Rifle Marksmanship," (Alexandria, Va.: Human Resources Research Organization, October 1955), p. 3.

²Tactics and Techniques of Infantry (Washington, D.C.: National Service Publishing Co., 1931), p. 137.

tactical experiences of small unit infantry leaders. The stated purpose of the book was to create an awareness of combat conditions which "surprise and confuse officers conditioned to peacetime conditions." The chapter on action and morale noted that the enemy was no longer in plain view and that the struggle was directed against an "invisible enemy." With the massing of troops no longer practical, the fight was conducted by small groups and individuals. The psychological reaction of individuals became increasingly important.³

This publication and others had little, if any, impact on marksmanship training for World War II combat. The KD ranges consisted of bull's-eye targets at designated distances from the firer. Firing a transition range of visible, stationary silhouette targets was the final phase of marksmanship instruction.

In 1954, sparked by a letter from a private citizen to President Eisenhower concerning "rifle shooting," the Human Resources Research Office (HumRRO) was directed to develop and evaluate a new course in basic rifle marksmanship, TRAINFIRE I. After research into recent combat experience, HumRRO developed a series of premises concerning combat marksmanship conditions. The very first premise was "enemy personnel targets are rarely visible except in a close assault."⁴

³Infantry in Battle (Richmond, Va.: Garret & Massie, 1939), p. 363.

⁴"TRAINFIRE I," pp. 9-10.

TRAINFIRE researchers set out to develop a realistic target device to meet scoring and safety requirements without sacrificing realism. They prepared an electronically powered, pop-up silhouette target that fell when struck by a bullet and a hand powered moving silhouette. It was decided to discard the bull's-eye targets since combat targets never appear in a similar nature.

Testing the new marksmanship program, HumRRO concluded that the experimental course improved both target detection and the ability to hit targets, once detected.

Most interesting was a one-day pilot study involving squads engaging hidden targets at the conclusion of the research. HumRRO researchers camouflaged 30 x 60 inch machinegun target panels among live-fire machineguns emplaced within the target areas. As the experimental squads moved out over broken terrain, they reacted to cues such as smoke, flash, dust, and sound. The results were a 20% hit probability against hidden targets.⁵ It was generally thought that this validated the transfer of TRAINFIRE training to a concealed target environment.

As a result of the TRAINFIRE I research, pop-up, knock-down targets became the new target configuration. In addition to teaching the mechanics of shooting, emphasis was placed on target detection, location and marking, range estimation, and the ability to hit targets low to the ground.

⁵"TRAINFIRE I," p. 45.

HumRRO moved next to develop an experimental course for employment of squad tactics and technique of fire, TRAINFIRE II. The emphasis of the subject matter in TRAINFIRE II was defined as "achieving group (squad) effectiveness in movement and delivery of fire against concealed targets."⁶

Experimental squads were tested on offense, defense, and combat patrol courses. Squads were measured on number of hits on pop-up targets and panels. Their ~~distribution~~ distribution of fire among the panels was also measured. Olive-drab paint and foliage, both natural and additional, obscured the panels from view. The pop-up silhouette targets were exposed to varying degrees. The researchers felt that the current landscape target should be eliminated since target detection and placing of fire upon "indistinct or unseen targets" cannot be taught using it. They also recommended dropping the premise of a standing man as a target in teaching the concept of continuous danger space because "such a target is rarely available in modern war."⁷ The researchers also reasoned that small arms fire is more effective in the defense.

The increased number of hits by the experimental squads caused the HumRRO researchers to recommend the TRAINFIRE programs for adoption.

⁶John A. Hammes, Henry E. Kelly, Howard H. McFann, and Joseph S. Word, "TRAINFIRE II: A New Course in Basic Technique of Fire and Squad Tactics" (Arlington, Va.: Human Resources Research Organization, 1957), p. 5.

⁷"TRAINFIRE II," p. 8.

The current U.S. Army marksmanship doctrine evolved directly from the TRAINFIRE I study. In FM 23-9, M16A1 Rifle and Rifle Marksmanship, the description of conditions effecting combat on the battlefield is a direct relisting of most of the premises concerning combat marksmanship conditions in TRAINFIRE. The FM states that most combat targets are linear and covered or concealed along "ground folds, hedges, and borders of woods." A central theme is that targets can be located through proficiency in target detection. Cues such as smoke, flash, dust, noise, or movement are the primary indications.⁸

Three types of target situations may potentially confront the rifleman: stationary targets (normally concealed), slowly moving targets, and rapidly moving targets. Therefore, engagement of the stationary target is considered "as much a problem of target detection as it is of marksmanship."⁹

The "crack-thump" technique of target detection is described in ranging and detecting an unseen enemy. The "crack" is the sound of the round breaking the air by one's head, and the following report of the weapon being fired is the "thump." One must mentally align the crack with the thump for direction. The range is based on five counts a second. The number of counts is multiplied by 100 meters

⁸FM 23-9, M16A1 Rifle and Rifle Marksmanship (Washington, D.C.: Department of the Army, 1974), p. 3.

⁹M16A1 Rifle and Rifle Marksmanship, p. 103.

to provide the range to target.¹⁰ This technique is no longer taught in infantry training programs.

The rifleman's task is defined as detecting targets, aiming his rifle, and firing the rifle. It is stated that a combat target "does not have to be visible to be hit by rifle fire" since an enemy seen moving into a concealed position can be engaged using a reference point nearby.¹¹ FM 23-9 clearly indicates that the soldier will have an indication of the enemy's specific location prior to aiming and firing his weapon.

CONCEALED TARGET EXPERIENCE

Major Frank Ely, a U.S. Army officer stationed with the 15th Infantry in China early in this century, wrote an early thesis on the concealed target problem. Noting that the nature of modern war had changed the battlefield, he cited the thousands of shots necessary to obtain a hit in battle. Soldiers were being killed by an "unseen enemy." Ely felt there was a need for a "battle control" device to mechanically adjust the angle of rifle fire low and evenly deliver it into the enemy's position. His battle control device to maintain the proper elevation on a rifle was found unacceptable by the School of Musketry where it clashed with the principle of precision marksmanship.

¹⁰M16A1 Rifle and Rifle Marksmanship, p. 106.

¹¹M16A1 Rifle and Rifle Marksmanship, p. 94.

Ely made the following argument:

On the target range hits are the direct result of fine individual skill in shooting. On the battle-¹² field, hits become a problem in probabilities.

Major Ely felt fire control placed terrific demands on leadership. The modern leader "must make every effort to keep his men in hand, and prevent them from blazing away at nothing."¹³

As the enemy closes on a soldier's position, the psychological stress of the battlefield increases proportionately. Ely describes soldiers' reactions under combat pressure:

Haste begets waste and pointing supplants aiming. But efficacy of fire demands both volume and accuracy and there is no real gain if, when the volume increases, accuracy is diminished; except that the more rapid fire is the natural "safety value" of the human emotions under the conditions, and the soldier's ¹⁴ measure of effect.

In his classic book Infantry Attacks, Field Marshal Erwin Rommel describes his experiences during World War I as an infantry platoon leader in the German Army. Rommel's passages relating a firefight with a French unit in the Doullon Woods are particularly revealing:

The fight in Doullon Woods emphasizes the difficulties of forest fighting. One sees nothing of the enemy. The bullets strike with a loud crash against trees and branches, innumerable ricochets fill the air, and it is hard to tell the direction of enemy fire. It is difficult to maintain direction and control the

¹²Major Frank D. Ely, Battle Fire--Its Waste and Its Control (no publisher, no date), p. 23.

¹³Ely, p. 4.

¹⁴Ely, p. 5.

front line; the commander can control only the men closest to him, permitting the remaining troops to get out of hand.¹⁵

Later, in the same action, Rommel found his unit caught between two lines of fire when his own troops fired from the rear.

During World War II it became obvious that a great amount of ammunition was being expended to no avail. Studies showed that 1,909 rounds were expended in fighting on Okinawa to produce one Japanese small arms casualty. At Anzio an extraordinary 18,171 rounds were averaged for each German small arms casualty.¹⁶ At the same time, it became apparent that a large number of American soldiers were not firing their weapons at all in the heat of battle. In response, the non-firers stated that they "couldn't see anything to shoot at" or felt they would "give their position away" if they fired.¹⁷

Field commanders on both sides encountered problems with concealed targets. Rommel, in 1940 a panzer division commander spearheading the drive across France, found a general slowness in answering effective fire from an "unseen enemy." On a number of occasions he had to personally order gunners to open fire into bushes and nearby houses when his column was stopped. Rommel attributed the slowness to the

¹⁵Erwin Rommel, Infantry Attacks (Potsdam, 1937), p. 20.

¹⁶"The Cost in Ammunition in Inflicting a Casualty," Project BALANCE, Operations Research Office (Johns Hopkins University, July 1953), p. 20.

¹⁷Roy E. Moore, "Shoot Soldier," Infantry Journal, April 1945, p. 21.

fact that "they had not been trained to open fire immediately at the spot where the enemy was thought to be."¹⁸

Rommel felt immediate return fire "into the area which the enemy is holding usually decides the issue."

His instructions were:

...open fire the instant an enemy shot is heard. This applies even when the exact position of the enemy is unknown, in which case the fire must simply be sprayed over enemy-held territory.¹⁹

General George S. Patton issued a letter of instruction to his subordinate commanders in 1944 addressing the same problem:

Infantry must move in order to close with the enemy. It must shoot in order to move. When physical targets are not visible, the fire of all infantry weapons must search the area occupied by the enemy. Use marching fire. It reduces the accuracy of his fire and increases our confidence. Shoot short. Ricochets make nastier sounds and wounds. To halt under fire is folly. To halt under fire and not fire back is suicide.²⁰

Patton continued on to note an inefficient application of fire to enemy targets in the European Theater of Operations:

Fire distribution is practically non-existent in our Army, with the result that those portions of the enemy who are visible receive all the fire, while those portions who are not visible fire on our men with perfect impunity. This defect will be corrected.²¹

In his classic book, Men Against Fire, Brigadier General S.L.A. Marshall noted the problems of command in future war. Marshall had been historian of the European Theater

¹⁸Liddel Hart, The Rommel Papers (New York: Harcourt, Brace, and Company, 1953), p. 76.

¹⁹Hart, p. 7.

²⁰George S. Patton, Jr., War As I Knew It (Cambridge, Mass.: The Riverside Press, 1947), p. 410.

²¹Patton, p. 411.

of Operations in World War II. Marshall's findings were based on hundreds of interviews with infantry companies in both world war II theaters of operations. Marshall discovered that on the average only fifteen percent of the infantrymen actually fired their weapons at the enemy. Even in well-trained and combat-seasoned units, the highest usage was 25%.²²

Marshall states that it is normal not to see targets in combat. Many men apparently did not fire for fear of rebuke for wasting ammunition when they did not see targets to engage.

The broad inference to training is that it is unprofitable in general work with the rifle to put the accent on live targets or even on clearly defined targets such as those used for record. The moral effect on the rifleman is almost paralyzing when he moves from these stereotypes to a battlefield where he is told to open fire on some apparently innocent feature of the landscape. Indeed, so much was said in training for the past war about harboring ammunition and making certain of the target that it became a brake upon field operations. The ranks frequently objected that their officers were overriding their own principles when the time came in battle when they insisted on heavy fire with no targets to be seen.²³

Marshall felt that, without lessening the emphasis on marksmanship, men should be taught in training to fire when ordered at whatever target designated. Targets such as river embankments, the base of forward trees in a woodline, or a hill crest were examples.

During maneuvers on military reservations, the availability of live targets reinforces the tendency to restrict fire in combat until live targets are observed,

²²Marshall, Men Against Fire, p. 54.

²³Marshall, Men Against Fire, p. 81.

according to Marshall. During the massive assault landings on Omaha Beach during the Normandy invasion on 6 June 1944, there was a conspicuous lack of visible targets. A systematic check of survivors revealed some startling facts. There were only about five infantry companies tactically effective for the greater part of the day, and only one of these was able to set up a solid base of fire at any time. In these effective companies, only twenty percent of the men fired their weapons during the whole day. Not more than 450 men firing their weapons in the decisive companies saved the beachhead and, perhaps, the Normandy invasion.²⁴

Marshall felt that fire superiority must be stressed. "Fundamentally, fire must always be beaten by fire."²⁵ Movement and other acts of initiative will come forth from the man who develops the "fire habit."

The Korean conflict found Marshall back in the field performing research. He discovered that the general awareness of the problem of nonfirers had increased the number of firers to the thirty-to-fifty percent range of participation.²⁶ Despite news reports to the contrary, he reported that the CCF attacks were normally in multiple, well-spaced lines rather than human waves. Marshall felt that better company leadership and verbal interaction had a very

²⁴ Marshall, Men Against Fire, p. 68.

²⁵ Marshall, Men Against Fire, p. 66.

²⁶ S.L.A. Marshall, "Infantry Operations and Weapons Usage in Korea, Winter 1950-51," Operations Research Office (Johns Hopkins University, 1953), p. 5.

solid effect on fire. In those cases of overrun U.S. units, Marshall found that men hit with surprise fire, and feeling they could not get their heads up, often lost their position for lack of fire. Still, in Korea, many nonfirers said they did not see a target at any time and felt it was best to hold fire.

Marshall felt that rifle effectiveness decided the fight during the last 150 yards. He was surprised to see the Army having to relearn many hard combat lessons, despite the number of World War II veterans.

But since (Korea) followed World War II by only five years, its main lesson might well be that an army loses its know-how almost at the speed of light.²⁷

An Operations Research Office study of infantry weapons usage in Korea during early 1952 was conducted using 636 enlisted men just off the line. Eighty-seven percent stated that over half the shots fired in the offense were directed at an area from which the fire was coming rather than aimed at a seen enemy. The average range of contact was less than 150 yards.²⁸

Many men fired from the hip and shoulder without stopping to take a sight picture, even when the target was visible. The prevalent feeling among the infantrymen was that their job was "primarily to pour out as much lead as possible to keep the enemy's head down." Thirty-four percent

²⁷Marshall, "Infantry Operations and Weapons Usage in Korea, Winter 1950-51," p. 45.

²⁸"Use of Infantry Weapons in Korea," Project DOUGHBOY (Johns Hopkins University, May 1952), p. 14.

of the men admitted that they had never used their sights at all in combat. The following results indicate that a soldier had a twenty percent better chance of seeing a visible target when in the defensive during the Korean conflict:

	Offensive Daytime	Defensive Daytime
Seen Targets:	50% (or less)	70% (or more) ²⁹

Following the Korean conflict, the TRAINFIRE study and its implimentation stirred a storm of controversy in marksmanship circles that still exists today. Colonel Henry E. Kelly from HumRRO dispatched a letter to the field explaining the premises and goals of the new program in 1955. Kelly writes of the dangers the new program hoped to resolve:

To create a false confidence based upon ability to hit clearly visible targets under ideal conditions may well have fatal battlefield results. There has been considerable speculation as to why U.S. riflemen have not made better use of their rifles in combat. Even a highly motivated soldier may well become discouraged and lose confidence after he has exposed himself to hostile fire to locate targets which he cannot find. One of two equally undesirable reactions may result, such a man may give up further effort to fire and spend his time improving his cover or he may distribute his fire wildy over the visible foreground. A rifleman taught to locate obscure targets, and in the absence of visible targets to place fire upon selected dangerous areas, will find his training usable and his confidence will increase ³⁰ with experience.

With the advent of the Vietnam conflict, a generation of TRAINFIRE-trained riflemen entered combat to test its validity. The M1 semiautomatic rifle had been replaced

²⁹"Use of Infantry Weapons in Korea," p. 16.

³⁰Colonel Henry E. Kelly, "The Trainfire Marksmanship Training," Fort Benning, Ga., 1955. (Mimeographed.)

with the M16 rifle, possessing both automatic and semi-automatic modes of fire.

In 1966 the Human Engineering Laboratories administered a questionnaire concerning small arms usage to 121 combat infantrymen who had been in Vietnam at least six months. In response to the question, "Do you ever see an enemy soldier to shoot at?", 93% reported "some of the time" or "never."³¹ The percentage of responses to the next question was of particular interest as to the nature of combat targets. "When you see an enemy soldier, he is usually: hidden, 66%; running, 27%; standing, 5%; prone, 2%."³² Eighty-three percent of the infantrymen, all equipped with the M16, responded that they would rather have a more accurate rifle than a rifle which fired faster.

Also during 1966 a HumRRO team interviewed 471 combat infantrymen throughout Vietnam to determine the nature of small unit combat actions. It was determined that 83% of the time contact was made while the U.S. unit was moving and over half the time the range to the enemy was within fifty meters. Seventy-four percent of the time the fire was pointing, unaimed. Only 37% of the time was fire directed at an observed enemy despite the close range.³³

³¹"Small Arms Use in Vietnam: Preliminary Results," Human Engineering Laboratories, August 1966, p. 3.

³²"Small Arms Use in Vietnam: Preliminary Results," p. 6.

³³George J. Magner, George R. Hoak, and T. O. Jacobs, "Interviews on Small-Unit Combat Actions in Vietnam," Interim Report (Arlington, Va.: Human Resources Research Organization, July 1967). (Mimeographed.)

An after-action interview with a lieutenant who was caught in an ambush points up the dilemma of the concealed target environment:

And all the time we were receiving fire, we never saw a VC, but it was coming from several different directions and my men would return the fire. They'd spray the brush. That's all we could do; we couldn't see them. But it was pretty tense because fire was coming in from all directions and we couldn't³⁴ tell where it was from.

A general tendency to respond with mass, indiscriminate fire, usually in the automatic mode, prevailed. In a pamphlet published by the 1st Infantry Division in February 1968 concerning fundamental infantry tactics, it was stated that enemy contact in the jungle usually occurred at "point blank range." Upon contact, the units were directed to respond with a "high volume of fire in the direction of enemy, not neglecting trees."³⁵

LTC Freddie Wenck, of the Weapons Department of the U.S. Army Infantry School, administered a questionnaire to 208 combat-experienced riflemen in 1969 and discovered that only 57% of his respondents had seen targets during daylight hours. Most delivered automatic pointing fire (often from the underarm position) if the target was within 125 meters. Thirty percent did not change their mode of fire no matter what the type of target or range.³⁶

³⁴Wagner, Hoak, and Jacobs, p. 93.

³⁵"Fundamentals of Infantry Tactics," 1st Infantry Division Pamphlet 350-1 (Republic of Vietnam, February 1968), p. 21.

³⁶LTC Freddie R. Wenck, "Analysis of Vietnam Weapons Questionnaires (M16A1 and others)" (Fort Benning, Ga.; Weapons Department, U.S. Army Infantry School, September 1969).

A former squadron commander in Vietnam, Colonel John W. McEnery, complained in Infantry magazine in 1970 that our soldiers had developed a misguided faith in the M16 on full automatic, despite the proven effectiveness of semiautomatic fire. He described the mass of fire from automatic bursts going high over the enemy's head, allowing him to hug the earth and eventually escape unscathed. Colonel McEnery felt the obvious answer was realistic training which would allow the soldier to clearly establish in his own mind what tactics and techniques were most successful.³⁷

TECHNIQUES AND TECHNOLOGY

In an article in Infantry magazine TRAINFIRE researcher Colonel Henry E. Kelly and LTC Frank Brown wrote of the combat engagement as a time-space problem. They noted that "a matter of one or two seconds can be the difference between life or death." Pointing out that TRAINFIRE was never designed as a complete marksmanship program, they stressed the need for different skills in the variety of situations presented by combat. Kelly and Brown outlined three types of needed skills:

- TYPE I: a pointing, "instinctive" fire delivered at close-in targets (0-35 meters) within $\frac{1}{2}$ to $2\frac{1}{2}$ seconds.
- TYPE II: a fast, coarsely aimed shoulder fire delivered at near targets (35-135 meters) within $2\frac{1}{2}$ to $3\frac{1}{2}$ seconds.

³⁷Colonel John W. McEnery, "We Can Do Better," Infantry, Nov-Dec 1970, p. 42.

TYPE III: an accurate, deliberately aimed fire delivered³⁸ at targets out to the maximum effective range.

The authors reported that recent tests indicated a ten-fold hit probability advantage for the defender, placing attacking infantry at a decisive disadvantage.³⁹

During Project MARKSMAN, a review of basic combat marksmanship by HumRRO, the most effective use of M16A1 rifle fire was examined. It was found that except at extremely short ranges, the quickest way to deliver a killing first round is "through the use of at least coarsely aimed fire from a shoulder-held weapon." For close-in work within 25 meters, the three-round automatic burst proved to be the most efficient mode of fire. Beyond 25 meters semiautomatic fire becomes progressively more efficient in increasing hit probability.⁴⁰ The semiautomatic fire provided a faster hit rate due to the additional time required to realign the weapon after an automatic burst of fire.

In a given period of time, semiautomatic fire will provide more target hits than automatic fire. Therefore, in a situation requiring the delivery of effective fire into multiple or area targets, semi-⁴¹ automatic fire would be superior.

The Advanced Research Projects Agency in 1973 ran a series of tests comparing the infantry platoon systems

³⁸Colonel Henry Kelly and LTC Frank Brown, "The Quick or Dead," Infantry, march-April 1963, p. 51.

³⁹Kelly and Brown, p. 50.

⁴⁰James W. Dees, George J. Magner, and Michael R. McClusky, "An Experimental Review of Basic Combat Rifle Marksmanship: MARKSMAN, Phase 1" (Arlington, Va.: Human Resources Research Organization, March 1971), pp. 9-10.

⁴¹Dees, Magner, and McClusky, p. 16.

of the United States, the Soviet Union, and the People's Republic of China. It was found that the participants possessed a very poor capability "to detect small arms from their appearances or firing signatures at other than short ranges." It was noted that this problem is of primary concern in the attack, but knowledge of this effect would be useful in the defense. It was further noted:

Platoons also have only marginal capability to detect personnel targets that are not line-of-sight, to identify them as personnel, and to locate them adequately for effective area fire from platoon ⁴² weapons.

Researchers found that platoon and squad leaders needed some means of effectively controlling the direct fire of their platoon weapons "into areas that cannot be seen by, or readily identified by their firers."⁴³

Michael McClusky of HumRRO determined that in dense vegetation the noise of weapons firing is scattered and distorted by foliage, and it becomes difficult to determine the source of enemy fire. In tests conducted in dense vegetation ten percent of the errors in determining direction to the sound source were reversals (greater than 90 degrees).⁴⁴ McClusky conducted an experiment to determine if auditory

⁴²"Baseline Comparisons of Infantry Platoon Systems," Advanced Research Projects Agency (Bethesda, Md.: Artex Corporation, May 1973), p. 115.

⁴³"Baseline Comparisons of Infantry Platoon Systems," p. 115.

⁴⁴Michael R. McClusky, "Literature Review for Auditory Localization," Fort Benning, Ga., 1974. (Mimeographed.)

localization is a skill which can be improved through training. He found no significant improvement provided through practice with feedback.⁴⁵

PSYCHOLOGICAL IMPACT OF CONCEALED TARGETS

Modern war is a stressful experience for the infantryman due to his vulnerability to its lethal nature. This stress is an important factor in combat effectiveness and must be examined closely.

Major Ely of the 15th U.S. Infantry described the soldier's reactions in the heat of battle early in this century:

Man, dominated by emotion on the field of battle fires precipitately, does not use his sights; sights with end of the gun or fires from the hip. If the emotion becomes intense under the action of the instinct of self-preservation, he fires everywhere, so long as he keeps firing; his bullets go into the⁴⁶ sky, or in the ground a few paces away.

Ely also noted that during combat not all losses are from enemy fire. "Serious losses" result from men of the same unit "firing on each other" during the confusion.⁴⁷

Following World War I the Infantry Journal's collection of "lessons learned," Infantry in Battle, pointed out the importance of preparatory training and leadership:

⁴⁵Michael R. McClusky, "Result of Auditory Localization Training" (Fort Benning, Ga.: Human Resources Research Organization, 1970). (Mimeographed.)

⁴⁶Ely, Battle Fire--Its Waste and Its Control, p. 6.

⁴⁷Ely, p. 6.

Although in the heat of battle, there is no longer time to prepare soldiers for the violent impressions of war, there are, however, two simple means by which a leader may lessen tension: He can do something himself that will give the men a feeling of security; or he can order his men to do something that requires⁴⁸ activity and attention.

Extensive examination of combat phenomenon was made by a group of behavioral scientists headed by Samuel Stouffer during World War II. Battle in Europe proved to be much more terrifying than the Pacific theater of operations. In response to the proposition that battle became increasingly more frightening with experience, 34 percent agreed in the Pacific and 74 percent in Europe agreed.⁴⁹ Stouffer found that the threat of "being maimed, of undergoing pain, and of being completely annihilated" produced extremely intense fear reactions that "may severely interfere with successful performances."⁵⁰

Training is critical to conditioning the soldier for combat. As Stouffer pointed out:

If soldiers are given no preparation for dealing with danger situations and if special situations and if special techniques for controlling fear reactions are not utilized, many men are likely to react to combat in a way which would be catastrophic to them-⁵¹ selves and to their military organization.

The study noted the disruptive influences of fear reactions can be reduced by a well designed, realistic

⁴⁸Infantry in Battle, p. 363.

⁴⁹Samuel A. Stouffer, et al., The American Soldier: Combat and Its Aftermath, Vol. II, (Princeton, N.J.: Princeton University Press, 1949), p. 71.

⁵⁰Stouffer, p. 192.

⁵¹Stouffer, p. 192.

training program.⁵² A survey of 344 combat infantrymen in Italy disclosed that the most frequently mentioned deficiency in preparatory combat training was a "lack of experience with live ammunition, under realistic conditions."⁵³

Marshall felt that the control of fear depends upon anticipation and understanding of dangers and distractions of true battlefield conditions.⁵⁴ He states that the feeling of isolation and lack of reaction on the part of combat infantry is caused by a lack of transfer value from training programs to combat.⁵⁵ As a result, after initial unit casualties the infantrymen must learn by trial and error.

Marshall reports that World War II battle resembled nothing the soldier had experienced previously:

The unit enters upon the battlefield and moves across ground within range of the enemy's small arms weapons. The enemy fires. The transition of that moment is wholly abnormal. He had expected to see action. He sees nothing. There is nothing to be seen. The fire comes out of nowhere. He knows that it is fire because the sounds are unmistakable. But that is all he knows for certain.⁵⁶

Marshall felt that training must teach the soldier the nature of the battlefield as he will experience it. Training must remove the false impressions of novels, war

⁵²Stouffer, p. 220.

⁵³Stouffer, p. 230.

⁵⁴Marshall, Men Against Fire, p. 37.

⁵⁵Marshall, Men Against Fire, p. 49.

⁵⁶Marshall, Men Against Fire, p. 47.

correspondents, and Hollywood movies.⁵⁷

The spiritual unity of small units is key to understanding the basic psychology of the infantryman, according to Marshall. Comradeship is more important to the infantryman than the most perfect of weapons. In Korea, the greater unity of action and weapons usage was attributed to "incessant noise--cheering, screaming, and the shouting of orders to individuals." Marshall describes it as "of the nature of a team game."⁵⁸

In order to determine the reasons for United States infantry units to break under heavy enemy pressure, an Operations Research Office team went to Korea to interview combat infantrymen in 1951. The report concluded that individual "mental and emotional" characteristics were primary in enabling an experienced unit to hold and fight against overwhelming opposition. Researchers pointed out that training should psychologically prepare soldiers to react to enemy firepower "so as to maintain their morale and to continue to carry out their assigned missions."⁵⁹

The Operations Research Office again sent a team to Korea in 1952 to administer complex physiological and

⁵⁷Marshall, Men Against Fire, p. 47.

⁵⁸Marshall, "Infantry Operations and Weapons Usage in Korea, Winter 1950-51," p. 5.

⁵⁹Harry O. Preston et al., "A Study of Ineffective Soldier Performance Under Fire in Korea, 1951" (Operations Research Office, Chevy Chase, Md.: Johns Hopkins University, October 1954), p. 7.

psychological tests to "front-line infantrymen who had just been engaged in major combat." They found no significant change in higher mental functions, but physically they had dehydrated and lacked certain types of white blood cells. The most important factor in lessening the stress of combat was identified as effective leadership.⁶⁰

While the psychological effect of small arms fire is difficult to assess in experiments, several studies by Psychological Research Associates (PRA) have explained this issue. In 1957 PRA tested the psychological effects of infantry weapons using the questionnaire technique with fifty combat veterans. The researchers concluded that experienced soldiers consider certain weapons more dangerous than others depending on whether operating in the offense or defense.⁶¹

Another study in 1957 compared infantrymen with and without combat experience using automatic and semiautomatic live fire. Increases in volume of fire, lack of combat experience, and decreases in distance were observed to have increased neutralization effects on the respondents. The automatic rifle fire was found significantly more effective in producing psychological effects than semiautomatic rifle fire.⁶²

⁶⁰"A Study of Combat Stress, Korea, 1952," Operations Research Office (Johns Hopkins University, March 1953), p. 4.

⁶¹Willard S. Vaughn and Peyton G. Walker, "Psychological Effects of Platoon Weapons--A Questionnaire Study," Psychological Research Associates, June 1957, p. 14.

⁶²John A. Whittenburg and James M. Whitehouse, "Psychological Effects of Small Arms Fire on Combat Experienced and Non-Experienced Infantrymen," Psychological Research Associates, June 1957, p. 5.

A study by the Human Engineering Laboratories examined the "effects of stress on the performance of riflemen." It was found that under stress soldiers fire more quickly and expend more rounds with lower hit probability. It was recognized by researchers that the full stress of combat would degrade performance even more.⁶³

In 1962 Colonel Henry Kelly, one of the TRAINFIRE researchers, wrote an article on "infantry combat training" in Infantry magazine. Kelly felt that a large percentage of combat casualties could be eliminated by better training. He states, "The rifleman frequently never acquires the skills of combat until he has engaged with the enemy."

Kelly noted that the transfer value of infantry training is reduced by excessive safety precautions. Tactical training using live ammunition under realistic conditions is necessary. With command restrictions on safety, little realistic training is conducted. Actions artificially controlled or using blank ammunition have no worthwhile transfer to combat, according to Kelly.⁶⁴

Kelly states that each new generation of infantrymen, trained on academic principles, is forced to learn in combat the "tricks of the trade," those hard-core skills which he could have mastered by practice under realistic conditions.

⁶³James P. Terre, Jr., and Richard R. Kramer, "The Effects of Stress on the Performance of Riflemen," Human Engineering Laboratories, Aberdeen Proving Ground, Md., May 1966, p. 13.

⁶⁴Colonel Henry E. Kelly, "Infantry Combat Training," Infantry, Nov-Dec 1962, p. 40.

Actually, in small unit infantry combat, each new generation of combat infantrymen learns, as revelations in the bitter school of combat, the lessons its fathers and grandfathers mastered in the same fashion. 65

While the infantry is often accused of "applying the lessons of the last war to the next" the exact opposite occurs, according to Kelly. Between wars the "tricks of the trade" at the small unit level are lost due to ineffective combat training. 66

In 1974 HumRRO produced a study of "the effects on training requirements of the physical and performance characteristics of weapons." Researchers noted that "to the extent transfer from training to combat is incomplete" the subsequent learning of important lessons under fire "may lead to costly losses on the battlefield." 67

CURRENT AND EMERGING DOCTRINE

In today's highly lethal environment it is recognized that the first battle of the next war could well be its last. It is clear that the U.S. Army has been historically unprepared for its first battle, and it must now prepare to win that first battle. It is understood that, within safety constraints, "training must simulate the modern battlefield." FM 100-5,

⁶⁵Kelly, "Infantry Combat Training," p. 38.

⁶⁶Kelly, "Infantry Combat Training," p. 38.

⁶⁷T. O. Jacobs, Margaret S. Selter, and Chester I. Christie, "The Effects on Training Requirements of the Physical and Performance Characteristics of Weapons" (Alexandria, Va.: Human Resources Research Organization, June 1974), p. 30.

Operations, the capstone manual of emerging U.S. Army doctrine, states that the soldier must train under conditions approximating battle with his weapons and as a member of his combat team to gain the needed confidence to fight outnumbered and win.⁶⁸

The most current manual on squad tactics is FM 7-7, The Mechanized Infantry Platoon/Squad. FM 7-7 states that the squad may choose to concentrate or distribute its fire. Concentrated fire is that which "is directed against a specific identified target--such as a machinegun."⁶⁹ Figure 1, Distributed Fire, is significant in that, unlike other similar illustrations, no targets are visible in the portrayed target area. The sketch shows how the squad members systematically cover the target area using sectors of fire. Distribution of fire is described as follows:

Fire is distributed in width and/or depth to keep all parts of the target under fire. Fire is placed on likely locations for enemy positions rather than into a general area. Each rifleman fires his first shot on that part of the target that corresponds to his position in the team. If he is left of the team leader, he fires to the left of the team leader's tracers.⁷⁰

Live fire training against concealed targets is nonexistent in current Army training programs. The

⁶⁸FM 100-5, Operations (Washington, D.C.: Department of the Army, 1 July 76), p. 1-4.

⁶⁹FM 7-7, The Mechanized Infantry Platoon/Squad (Washington, D.C.: Department of the Army, 30 Sep 77), p. 3-21.

⁷⁰FM 7-7, The Mechanized Infantry Platoon/Squad, p. 3-22.

DISTRIBUTED FIRE



FIGURE 1: DISTRIBUTED FIRE

71

current marksmanship and technique of fire ranges contain only visible pop-up targets. The camouflaged hit panels on the TRAINFIRE II experimental ranges on which the study was based exist on no known firing ranges.

Current "realistic" combat training is primarily conducted with the expectation of observing a live target and

⁷¹FM 7-7, The Mechanized Infantry Platoon/Squad, p. 3-22.

using blank ammunition. The Squad Combat Operations Exercise, Simulated (SCOPES) is "based on the premise that a soldier performs in combat as he has trained under combat conditions." Each soldier has numbered patches attached to his helmet and a 6-power telescope mounted to his weapon to assist in reading numbers of the opposing squad. Casualties are assessed as numbers are read from opposing soldiers' helmets.

The concept is based on a positive correlation between the ability of a soldier to engage and hit targets with live ammunition and his ability to read numbers on a man's helmet through a telescopic sight and engage him with blank fire. 72

While SCOPES is interesting and teaches use of cover and concealment, it also teaches some expectations which may prove undesirable in the future.

SUMMARY OF LITERATURE SEARCH

There are several conclusions that may be drawn from the literature search. The experiences of four wars and current U.S. Army doctrine indicate that unseen or concealed targets on the battlefield are the norm. However, current Army doctrine in marksmanship still leads one to believe that concealed targets are detectable prior to engagement.

The TRAINFIRE programs that were developed to teach the infantryman to engage concealed targets were eventually implimented as visible target ranges. Statistics from

⁷²"Training Management," Fort Leavenworth, Ks.: U.S. Army Command and General Staff College, August 1977, p. 3-139. (Excerpt of TC 7-2.)

Vietnam combat indicate that additional instruction in target detection of current training programs did not increase the soldier's capability to resolve unseen targets. The precision marksmanship required against pop-up targets on current ranges was apparently not transferred to the combat environment where mass automatic fire prevailed.

The advantage of detecting and effectively engaging targets lies with the defender. When attacking, the ability to detect targets is greatly diminished, along with the effectiveness of fire.

The psychological effect of concealed targets increases anxiety and stress due to the lack of prior preparatory instruction. Realistic training, teamwork, and leadership are critical elements in reducing stress.

For effective transfer to occur from training to combat, the situations must be similar. Live fire training is necessary to serious later value in combat.

To engage targets that are concealed, semiautomatic fire provides the most lethal results. For suppression of the enemy, automatic fire results in fewer hits but neutralizes faster than the semiautomatic mode. This neutralization effect, if sustained, would degrade the enemy's fire effectiveness and permit friendly maneuver.

CHAPTER III

METHODOLOGY

The research of Chapter II will provide the basis for further examination of the role of infantrymen in the concealed target engagement. The combat statistics, historical commentaries, and empirical research by various agencies will be drawn together in the findings to respond to the questions raised in the subproblems. These questions are:

1. How prevalent are concealed targets in combat?
2. What is the psychological impact of concealed targets?
3. Are concealed targets detectable using current doctrine and technology?
4. What techniques of fire offer the best effects against concealed targets?

In order to fully address the hypothesis "Concealed target training for the infantryman will improve combat effectiveness and the ability to achieve fire superiority," other important questions must also be answered. These questions comprise essential elements of analysis (EEA) and provide the needed framework for logical analysis.

EEA 1 What constitutes combat effectiveness under current and emerging doctrine?

EEA 2 What is the best means of achieving fire superiority with small arms?

EFFECTIVE FIRE

During small arms engagements it is desirable to achieve fire superiority. This means the effects of our fire, through the production of casualties and near misses, suppress and diminish enemy fire. The achievement of fire superiority allows the dominant fire element to achieve the initiative and accomplish its mission.

Superior fire is a function of accuracy and rate of fire. Hit probability against a target, either visible or concealed, increases rapidly as more rounds are placed in the target area. With increased hit probability at closer ranges, near targets prove more dangerous and time sensitive than targets at some distance. Short automatic bursts from the shoulder would be used upon receiving fire at close ranges in dense brush. Aimed, semiautomatic fire would be deliberately delivered against targets at longer distances for the desired effect.

The length of time of engagement and availability of ammunition influence the rate of fire and, hence, fire superiority. There is a limit to how long effective fire can be sustained. High cyclic rates of fire tend to waste ammunition due to the fact that only the first two rounds of an automatic burst with the M16A1 rifle are accurate.

Fire superiority is often determined early in an

engagement. An advantage lies with the element that initiates the action. As Rommel stated, "The day goes to the side that is the first to plaster its opponent with fire."¹ Emerging doctrine as outlined in FM 100-5, Operations, in its chapter on "How to Fight" in future battle stresses fire superiority: "Forward maneuver elements must be trained to suppress enemy weapons or they will suffer unacceptable losses every time they break cover and concealment."²

ROLE OF SMALL ARMS FIRE

The purpose of the rifle is to deliver the type and volume of fire necessary for the infantryman to successfully perform his primary mission. Effective delivery of fire is essential in all individual and small unit combat actions. As S.L.A. Marshall noted during World War II, "Fire must always be beaten by fire."³

Today, increased mechanization provides infantry with the mobility to conduct combined arms operations. FM 100-5 describes the role of the infantry in the combined arms team in future battle:

The mechanized infantryman can fight from his armored carrier while maneuvering across the battlefield, adding his suppressive fires and observation to armored task forces. When tanks cannot advance,

¹Liddel Hart, The Rommel Papers (New York: Harcourt, Brace, and Company, 1953), p. 7.

²FM 100-5, Operations (Washington, D.C.: Department of the Army, 1 July 76), p. 3-14.

³S.L.A. Marshall, Men Against Fire (New York: William Morrow and Company, 1947), p. 66.

he often takes the lead. He can, by fire and movement, eliminate antitank gunners concealed in woods or buildings, breach minefields, and employ stealth⁴ or airmobility to seize key terrain.

PSYCHOLOGICAL EFFECTS

The combined effects of small arms on the target array in hits and near misses will degrade the opposing force. To what degree suppression occurs depends on several variables--range, volume of fire, accuracy, etc. The potential enemy, if well lead and seasoned to the effects of fire, may require lethal effects for full suppression. It must be recognized that even a suppressed unit will not remain so if the fire is not sustained. There are no absolutes with which to measure suppressive fires.

FM 100-5 states that in future war U.S. combat forces will have to "destroy or suppress weapons which have taken full advantage of cover and concealment."⁵ The current emphasis on detecting the target prior to engagement may well provoke unnecessary casualties with modern weapon lethalties. The dilemma of the concealed target will continue to confuse the infantryman in future battle as in World War II, Korea, and Vietnam. To hesitate under fire and search for targets without responding with immediate fire may provide terminal results. While in World War II the rifleman often held his fire, his Vietnam-era counterpart often found release in indiscriminate

⁴FM 100-5, Operations, p. 2-11.

⁵FM 100-5, Operations, p. 3-4.

automatic fire. While this reaction was better than not firing at all, the vast majority of rounds proved totally ineffective to the enemy.

COMPONENTS OF COMBAT EFFECTIVENESS

Combat effectiveness can only be measured by one yardstick--ability to accomplish the individual or unit mission in combat. The components that allow this are survivability (cover and concealment), teamwork, and fire superiority. Within this framework we must consider what improvement, if any, will be realized through concealed target training.

CHAPTER IV

FINDINGS

This chapter will present the findings discovered from the review of related literature and the methodology application. The subproblems will be answered and discussed individually prior to considering the questions examined in the Essential Elements of Analysis.

SUBPROBLEMS

1. HOW PREVALENT ARE CONCEALED TARGETS IN COMBAT?

Approaching this problem from the perspective of recent combat in this century and current U.S. Army doctrine, the concealed target is the predominant form that opposing enemy personnel assume on the battlefield. The degree to which targets are exposed is a product of the mode of operation. Due to the movement required by offensive operations, a higher degree of target exposure may be expected. Personnel in prepared defensive positions will rarely be observed due to their stationary, camouflaged posture.

S.L.A. Marshall's historical analysis of World War II combat concluded that most of the targets engaged were "positions" rather than visible enemy personnel.¹ Studies

¹S.L.A. Marshall, Men Against Fire (New York: William Morrow and Company, 1947), pp. 77-80.

conducted during both the Korean and Vietnamese conflicts using combat infantrymen as subjects confirm the continuing lack of visible combat targets. When exposed, personnel targets are normally moving from one concealed position to another and are time sensitive. U.S. infantry interviewed for the Korean data indicated that over 50% of the offensive engagements presented no visible enemy.² In Vietnam similar studies revealed 66% of the firefights were conducted against totally concealed opposing personnel.³ Current doctrine, derived to a large degree from the TRAINFIRE studies, confirms that enemy personnel targets are rarely visible except in the close assault.⁴

The degree to which targets will be exposed in future combat is expected to continue to decline. This is in large part due to the increasing lethality of modern weaponry.⁵

2. WHAT IS THE PSYCHOLOGICAL IMPACT OF CONCEALED TARGETS?

The lack of similarity between existing combat firing ranges and the actual combat environment will perplex the infantryman during situations requiring confidence and

²"Use of Infantry Weapons in Korea," Project DOUGHBOY (Johns Hopkins University, May 1952), p. 14.

³"Small Arms Use in Vietnam: Preliminary Results," Human Engineering Laboratories, August 1966, p. 6.

⁴FM 23-9, M16A1 Rifle and Rifle Marksmanship (Washington, D.C.: Department of the Army, 1974), p. 3.

⁵FM 100-5, Operations (Washington, D.C.: Department of the Army, 1 July 1976), p. 2-9.

teamwork. The inability to transfer previous marksmanship training is primarily due to a "silhouette mindset," an expectation of seeing a target prior to engagement. Under the full stress of intense fire from an unseen enemy, the soldier can be expected to be overcome by inertia and not return fire or fire indiscriminately about the area in desperation.⁶ Attempting to "hose down" the area with fire will normally produce few enemy casualties but provide the benefit of an emotional release in the act of firing.⁷

The adverse impact of confronting a concealed enemy can be offset by both realistic preparatory training and effective leadership techniques. Training is effective to the degree it simulates the actual nature of future combat.⁸ For the soldier to respond confidently to a concealed enemy he must, as a result of live fire training under realistic conditions, accurately anticipate his future activity.

Effective leadership is essential for the unit to survive and function as a team. If no action is directed, an unforeseen situation creates feelings of isolation and destroys morale.⁹ Combat leaders may reduce stress by

⁶Colonel Henry E. Kelly, "The Trainfire Marksmanship Training," Fort Benning, Ga., 1955. (Mimeographed.)

⁷Infantry in Battle (Richmond, Va.: Garret & Massie, 1939), p. 363.

⁸Colonel Henry E. Kelly, "Infantry Combat Training," Infantry, Nov-Dec 1962, p. 38.

⁹Samuel A. Stouffer et al., The American Soldier: Combat and Its Aftermath, Vol. II, (Princeton, N.J.: Princeton University Press, 1949), p. 192.

directing previously rehearsed actions (battle drill) or anything requiring action.¹⁰

3. ARE CONCEALED TARGETS DETECTABLE USING CURRENT DOCTRINE AND TECHNOLOGY?

The target detection methods outlined in FM 23-9, M16A1 Rifle and Rifle Marksmanship, relate to skills in locating visual and auditory cues.¹¹ The target detection practice conducted during current infantry training is designed to compliment firing range experiences. Unfortunately, our soldiers trained in these techniques during Vietnam displayed no greater ability to resolve combat targets than their predecessors.¹² Obviously, some targets cannot be detected by normal means due to their stationary position and effective use of camouflage.

Soldiers under the full stress of combat, their perspectives lowered to inches above the ground, cannot be expected to identify sources of fire using existing techniques. Multiple rounds fired simultaneously will preclude the "crack-thump" method of target detection. Studies also conclude that identification of weapons by their appearance and firing signatures is very difficult except at extremely close ranges.¹³

¹⁰Infantry in Battle, p. 363.

¹¹FM 23-9, M16A1 Rifle and Rifle Marksmanship, p. 94.

¹²"Small Arms Use in Vietnam," p. 6 and "Use of Infantry Weapons in Korea," p. 14.

¹³"Baseline Comparisons of Infantry Platoon Systems," Advanced Research Projects Agency (Bethesda, Md.: Artex Corporation, May 1973), p. 115.

While concealed targets are "detectable," it is not likely that available techniques will resolve them to any significant degree. While efforts for target identification must be ongoing, targets must be dealt with in their concealed state.

4. WHAT TECHNIQUES OF FIRE OFFER THE BEST EFFECTS AGAINST CONCEALED TARGETS?

As Major Frank Ely of the 15th Infantry concluded, neither mass indiscriminate fire nor accurate target shooting techniques resolve the concealed target issue. Ely felt accuracy and volume both must be maintained and directed evenly into the area in which the enemy is suspected of being located.¹⁴ General Patton directed that infantry use searching fire into the area the enemy is thought to occupy.¹⁵ This would indicate that it is of first importance to correctly identify the general source of fire (e.g. a woodline, a group of buildings, a hedgerow). Next, fire distribution techniques must be used to direct and control squad fires into the suspected enemy locations. Sectors of fire and tracer designation would be correctly utilized here.¹⁶

Except at point-blank range, the fire should be

¹⁴Major Frank D. Ely, Battle Fire--Its Waste and Its Control (no publisher, no date), p. 5.

¹⁵George S. Patton, Jr., War As I Knew It (Cambridge, Mass.: The Riverside Press, 1947), p. 410.

¹⁶FM 7-7, The Mechanized Infantry Platoon/Squad (Washington, D.C.: Department of the Army, 30 Sep 1977), p. 3-22.

semiautomatic and accurately placed from the shoulder. This does not mean sights will always be used or use of automatic fire will be ignored. When faced with a high volume of enemy fire, automatic fire may be necessary to suppress enemy fire and insure survivability.¹⁸ It must be recognized that there is a tradeoff between hit probability and suppression when resorting to the automatic mode. When automatic fire is used, it should be closely controlled and confined to deliberately-placed, three-round bursts.¹⁹ In most cases, indiscriminate automatic fire is a waste of a unit's fire delivery potential.

When confronted by surprise fire from a concealed enemy, rapid response is critical. Accurate, correctly placed fire, delivered in volume, can break up the attack by fire and return the initiative to the friendly force. Much of combat is a time-space problem requiring simple motor skills that may be developed in repetitious training.²⁰ Units must rehearse their fire distribution techniques against landscape targets for later application in actual combat.²¹

¹⁷James W. Dees, George J. Magner, and Michael R. McClusky, "An Experimental Review of Basic Combat Rifle Marksmanship: MARKSMAN, Phase 1" (Arlington, Va.: Human Resources Research Organization, March 1971), pp. 9-10.

¹⁸Marshall, Men Against Fire, p. 66.

¹⁹Dees, Magner, and McClusky, pp. 9-10.

²⁰Kelly, "Infantry Combat Training," p. 38.

²¹Marshall, Men Against Fire, p. 81.

ESSENTIAL ELEMENTS OF ANALYSIS:

1. WHAT CONSTITUTES COMBAT EFFECTIVENESS UNDER CURRENT AND EMERGING DOCTRINE?

Besides survivability and teamwork, the primary component of combat effectiveness is fire superiority. The achievement of fire superiority allows the dominant fire element to achieve the initiative and accomplish its mission. FM 100-5, Operations, cites suppression of enemy weapons as essential to survival and subsequent mission accomplishment.²² The attacker will attempt to gain fire superiority to degrade the enemy's fire effectiveness and permit friendly maneuver. The defender will try to break up the enemy's attack and destroy him by fire.

2. WHAT IS THE BEST MEANS OF ACHIEVING FIRE SUPERIORITY?

Fire superiority is a function of rate of fire and accuracy of fire delivered to the enemy position. The volume of fire, the extent of combat experience, and the closeness of near misses determine the degree of suppression that occurs. For suppressive effects, automatic fire results in fewer hits but neutralizes faster than the semiautomatic mode.²³

Close range engagements require a more immediate, high volume rate of fire. Due to the increased lethality

²²FM 100-5, Operations, p. 3-14.

²³John A. Whittenburg and James M. Whitehouse, "Psychological Effects of Small Arms Fire on Combat Experienced and Non-Experienced Infantrymen," Psychological Research Associates, June 1957, p. 5.

of short range engagements, they tend to be more dangerous and time sensitive. Since hit probability declines as distance to the target increases, precise, aimed fire is more desirable at longer ranges.

A distinct advantage lies with achieving the initiative by being first to fire.²⁴ Combat leaders must train their soldiers to distribute their fire across the entire enemy position, not just those portions which can be identified. A failure to engage all the enemy targets, both visible and concealed, will spell defeat.²⁵

²⁴Liddel Hart, The Rommel Papers (New York: Harcourt, Brace, and Company, 1953), p. 7.

²⁵Patton, War As I Knew It, p. 411.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

This study was developed to determine if concealed target training for the infantryman would improve combat effectiveness and the ability to achieve fire superiority. This hypothesis has been proved correct through the process of detailed analysis of available studies and historical data. The analysis of research used a number of essential elements of information and subproblems as a framework for study.

Training specifically designed for engagement of concealed targets would significantly contribute to preparing infantrymen for actual combat. Concealed targets are the dominant form combat targets assume, and distribution of fire over an area held by the enemy represents the dominant method of engagement. Transfer of current preparatory training, which stresses engagement of visible silhouette targets, to most combat situations is lacking. This lack of experience in firing at hidden or moving targets will seriously degrade future combat effectiveness if not corrected. The key to any realistic program is actual distribution of live fire against hidden targets. Effective suppression of concealed enemy personnel is necessary for achievement of fire superiority.

The TRAINFIRE studies were a bold attempt to solve the concealed target problem. The later implementation of the TRAINFIRE ranges excluded the moving and hidden target configurations found on the earlier experimental ranges. As a result, TRAINFIRE proved to be an extension of Known Distance range firing, substituting pop-up silhouette targets for bull's-eye targets.

Stationary, clearly defined targets are rare on the battlefield. The concealed (as well as moving) target presents a dilemma to the TRAINFIRE-prepared rifleman. The dissimilarity between training and combat environments will not produce the cohesive unit action needed to fight outnumbered and win. Techniques of fire distribution and control should be taught and practiced in the environment the soldier will encounter. Only through realistic training will the soldier clearly establish in his own mind what tactics and techniques are most successful for later application in combat.

RECOMMENDATIONS

As a result of this study, it is recommended that concealed target training be made a part of advanced infantry training. The engagement of concealed targets requires actual landscape and live ammunition. Special equipment should include camouflaged hit panels in typical concealed target positions and sound emitters. The teamwork and techniques of fire must be practiced in realistic settings for effective transfer to actual combat to occur.

Excessive and restrictive safety measures in training retard the later independent and coordinated actions necessary under fire in combat.

It is recommended that current field manuals and training methods be closely evaluated to determine the degree they reinforce the expectation of engaging visible targets in combat. Examples of actions that create this "silhouette mindset" are field manual sketches of soldiers firing at opposing squads standing in the open, pop-up targets on cleared firing ranges, SCOPES exercises, etc. We can ill afford having our soldiers hold their fire until a visible target appears or firing wildly about the area in desperation.

It is also recommended that an agency be designated to examine the Army rifle marksmanship program as a system in light of the nature of combat targets. TRAINFIRE is not designed as a total combat firing program. TRAINFIRE targets represent less than ten percent of actual combat target forms. Well over eighty percent of the rounds fired in combat are distributed into an area the enemy occupies rather than at visually defined targets.

What type of program is needed? It is apparent that basic marksmanship must teach the individual to shoot his weapon with a high degree of accuracy against point targets. This is not being accomplished today. After gaining confidence and accuracy, the rifleman should move to mastering skills in quick fire, moving target engagement,

and area fire against concealed targets.

Unit leaders must be trained to rapidly evaluate and determine the origin of enemy fire and "template" the likely positions for an enemy unit in that location. Using existing sector of fire techniques, the squad or platoon must deliberately distribute their fire into suspected enemy locations. Leaders must be prepared to curb high cyclic rates of fire into the general area of the enemy and quickly designate the targets using tracer designation or other means.

The revision of our current marksmanship program will be a costly proposition in both time and money. There is no short cut if we wish to make our soldiers competent combat riflemen. Under the current program the rifleman must wait to learn the skills of combat until he has engaged the enemy. Concealed target training using live ammunition under realistic conditions offers the potential of advancing combat effectiveness, in addition to eliminating a large percentage of initial combat casualties. Psychologically, it will further prepare the soldier to respond confidently to his first combat experience.

The United States Army can ill afford not to upgrade its current marksmanship program to include concealed target engagement.

BIBLIOGRAPHY

BIBLIOGRAPHY

BOOKS

- Clarke, Bruce C., General. Guidelines for the Leader and Commander. Harrisburg, Pa.: Stackpole Books, 1963.
- Ely, Frank D., Major. Battle Fire--Its Waste and Its Control. Tientsin, China: No publisher. No date.
- Hart, Liddel. The Rommel Papers. New York: Harcourt, Brace, and Company, 1953.
- Infantry in Battle. Richmond, Va.: Garret and Massie, 1939.
- Marshall, S.L.A. Men Against Fire. New York: William Morrow and Company, 1947.
- Moyer, Frank A., and Scroggie, Robert J. Combat Firing Techniques. Boulder: Paladin Press, 1971.
- Patton, George S., Jr. War As I Knew It. Cambridge, Mass.: The Riverside Press, 1947.
- Rommel, Erwin. Infantry Attacks. Potsdam, 1937.
- Stouffer, Samuel A., et al. The American Soldier: Combat and Its Aftermath, Vol. II. Princeton, N.J.: Princeton University Press, 1949.
- Tactics and Techniques of Infantry. Washington, D.C.: National Service Publishing Company, 1931.
- Weller, Jac. Weapons and Tactics. London: Nicholas Vann (Publishers) Limited, 1966.

GOVERNMENT DOCUMENTS

- AR 310-25, Dictionary of United States Army Terms, Washington: Government Printing Office, June 1, 1972.

PERIODICALS AND ARTICLES

- Kelly, Henry E., Colonel. "Infantry Combat Training," Infantry, November-December 1962.
- Kelly, Henry, Colonel, and Brown, Frank, LTC. "The Quick or Dead," Infantry, March-April 1963.

McEnery, John W., Colonel. "We Can Do Better," Infantry
November-December 1970.

Moore, Roy E. "Shoot Soldier," Infantry Journal, April 1949,
p. 21.

Stacy, Aubrey B., CPT. "Beyond Trainfire," Infantry,
November-December 1977.

PAMPHLETS AND PAPERS

"Baseline Comparisons of Infantry Platoon Systems,"
Advanced Research Projects Agency, Bethesda, Md.:
Artex Corporation, May 1973.

Coleman, P. A. "Auditory Distance Localization and Stimulus
Familiarity," Report No. 384. Fort Knox, Ky.: U.S.
Army Medical Research Laboratory, April 1959.

"The Cost in Ammunition in Inflicting a Casualty." Project
BALANCE, Operations Research Office, Johns Hopkins
University, July 1953.

Dees, James W.; Wagner, George J.; and McClusky, Michael R.
"An Experimental Review of Basic Combat Rifle
Marksmanship: MARKSMAN, Phase 1." Arlington, Va.:
Human Resources Research Organization, March 1971.

Dobbins, D. A., and Kindick, C. M. "Jungle Accoustics II:
Localization of Sounds in the Jungle," Research Report
No. 9. U.S. Army Tropic Test Center, April 1967.

Feldman, Leon; Pettijohn, William C.; and Reed, J. D.
"Rifle Accuracies and Hit Probabilities in Combat,"
ORO-SP-158. Operation Research Office, Johns Hopkins
University, 1960. CONFIDENTIAL.

"Fundamentals of Infantry Tactics," 1st Infantry Division
Pamphlet 350-1. Republic of Vietnam, February 1968.

Hammes, John A.; Kelly, Henry E.; and McFann, Howard H.
"TRAINFIRE II: A New Course in Basic Technique of
Fire and Squad Tactics." Arlington, Va.: Human
Resources Research Organization, 1957.

Jacobs, T. O.; Selter, Margaret S.; and Christie, Chester I.
"The Effects on Training Requirements of the Physical
and Performance Characteristics of Weapons." Alexandria,
Va.: Human Resources Research Organization, June 1974.

Kelly, Henry E., Colonel. "The Trainfire Marksmanship Training." Fort Benning, Ga., 1955. (Mimeographed.)

M16A1 Rifle and Rifle Marksmanship, FM 23-9. Washington, D.C.: Department of the Army, 1974.

"M16A1 Rifle Marksmanship," Draft Army Subject Schedule 23-72. Washington, D.C.: Department of the Army, June 1973.

McClusky, Michael R. "Literature Review for Auditory Localization." Fort Benning, Ga., 1974. (Mimeographed.)

_____. "Results of Auditory Localization Training." Fort Benning, Ga.: Human Resources Research Organization, 1970.

McFann, Howard H.; Hammes, John A.; and Taylor, John E. "TRAINFIRE I: A New Course in Basic Rifle Marksmanship," Technical Report 22. Alexandria, Va.: Human Resources Research Organization, October 1955.

Magner, George J.; Hoak, George R.; and Jacobs, T. O. "Interviews on Small-Unit Combat Actions in Vietnam," Interim Report. Arlington, Va.: Human Resources Research Organization, July 1967.

Marshall, S.L.A. "Infantry Operations and Weapons Usage in Korea, Winter 1950-51," ORO-R-13. Operations Research Office, Johns Hopkins University, November 1953.

The Mechanized Infantry Platoon/Squad, FM 7-7. Washington, D.C.: Department of the Army, 30 Sep 1977.

Operations, FM 100-5. Washington, D.C.: Department of the Army, 1 July 1976, pp. 1-4.

Preston, Harry O., et al. "A Study of Ineffective Soldier Performance Under Fire in Korea, 1951." Operations Research Office, Chevy Chase, Md.: Johns Hopkins University, October 1954.

"Small Arms Use in Vietnam: Preliminary Results," Technical Note 5-66. Human Engineering Laboratories, August 1966.

"Small Arms Weapons Systems (SAWS)," U.S. Army Combat Developments Command Experimentation Command, May 1966.

"A Study of Combat Stress, Korea, 1952," Operations Research Office, Johns Hopkins University, March 1953.

Terre, James P., Jr., and Kramer, Richard P. "The Effects of Stress on the Performance of Riflemen." Human Engineering Laboratories, Aberdeen Proving Ground, Md., May 1966.

"Training Management." Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, August 1977.

"Use of Infantry Weapons in Korea." Project DOUGHBOY, Johns Hopkins University, May 1952.

Vaughn, Willard S., and Walker, Peyton G. "Psychological Effects of Patterns of Small Arms Fire," PRA Report 57-16. Psychological Research Associates, July 1957.

_____. "Psychological Effects of Platoon Weapons-- A Questionnaire Study." Psychological Research Associates, June 1957.

Wenck, Freddie R., LTC. "Analysis of Vietnam Weapons Questionnaires, (M16A1 and Others)." Fort Benning, Ga.: Weapons Department, U.S. Army Infantry School, September 1969.

Whittenburg, John A., and Whitehouse, James M. "Psychological Effects of Small Arms Fire on Combat Experienced and Non-Experienced Infantrymen." Psychological Research Associates, June 1957.